
MAXIMUM ALLOWABLE LOAD FOR CEILING WIRES

Disciplines: Structural

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Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Publications](#) webpage.

PURPOSE

This Interpretation of Regulations (IR) clarifies the allowable load capacity of mild steel wire used on construction projects under DSA jurisdiction.

SCOPE

This IR is applicable to *galvanized soft annealed mild steel wire*, as defined in the American Society for Testing (ASTM) A641 (Class 1 Coating), which are commonly used as hanger wires and brace wires in suspended ceiling assemblies. *IR 25-2: Metal Suspension Systems for Lay-in Panel Ceiling* and *IR 25-3: Gypsum Board Ceiling Suspension Conventional Construction – One Layer* define prescriptive requirements for typical ceiling construction. Where a ceiling complies with the provisions of IR 25-2 or IR 25-3, the designer need not independently substantiate the capacity of hanger or brace wires. As such, this IR is primarily applicable to custom ceiling designs that deviate from the prescriptive limitations of IR 25-2 or 25-3.

BACKGROUND

California Building Code (CBC) Sections 808 and 2506 address suspended acoustical, lay-in panel, and gypsum board ceiling systems and adopt the requirements of ASTM C635 and C636. Design for seismic forces is addressed by American Society of Civil Engineers (ASCE) 7 Section 13.5.6 as modified by CBC Section 1617A.1.21 and based upon ASTM E580.

1. MATERIAL STRENGTH

Ceiling wire shall be Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A641. Wire shall be soft temper with a minimum ultimate tensile stress of 70 kips per square inch (ksi). All wire properties shall be specified on the construction documents.

2. DESIGN VALUE

2.1 The tensile design capacity of ceiling wire shall be established based on rationale analysis and engineering principles. In combination with the ultimate stress defined in Section 1 above, a safety factor (Ω_t) of 2.00 may be used to determine the allowable tensile capacity.

2.2 Wire diameters used in the determination of tensile capacity shall be per the United States (U.S.) Steel Wire Gauge.

2.2.1 The diameter of a #12 gauge wire is 0.106 inch.

2.2.2 The diameter of a #10 gauge wire is 0.135 inch.

3. TURN OF WIRE CONNECTIONS

3.1 Four (4) turns of the wire within 1½" will develop the full allowable load defined in Section 2 above.

3.2 Three (3) turns of the wire within 3" will develop one-half the allowable load defined in Section 2 above.

MAXIMUM ALLOWABLE LOAD FOR 10 GAUGE AND 12 GAUGE WIRES

3.3 Refer to IR 25-2 Appendix A Sheet 4.10 for a graphical illustration of Sections 3.1 and 3.2 above.

3.4 For wire sizes larger than #10 gauge refer to Section 4.4 below.

4. LIMITATIONS

4.1 These values are for tension only.

4.2 Tearing of thin metal by the wire is not accounted for in these values but must also be considered. Where the tear-through capacity of a looped connection may control the wire capacity, DSA may require this limit state to be substantiated. Refer to Section 4.5 below.

4.3 If a project specifies a special wire type different than defined in Section 1 above, DSA will evaluate the proposal on a project-by-project basis. Subject to DSA approval, a higher load capacity may be justified.

4.4 Turn of wire connection capacities defined in Section 3 above apply to #10 gauge and smaller wire. For wire sizes larger than #10 gauge, the capacity of turn of wire connections shall be substantiated in accordance with Section 4.5 below.

4.5 The structural adequacy of design parameters beyond the limitations stated herein can be substantiated in accordance with *IR A-5: Acceptance of Products, Materials and Evaluation Reports*. In the absence of an evaluation report complying with IR A-5, DSA may accept other evidence or project-specific testing. Determination of such acceptance will be on a project-by-project basis at the discretion of the plan review team for the subject project.

REFERENCES

California Code of Regulations (CCR) Title 24
Part 1: California Building Code (CBC), Section 808
Part 2: California Building Code (CBC), Sections 1617A.1.21, 2506.

This IR is intended for use by DSA staff and by design professionals to promote statewide consistency for review and approval of plans and specifications as well as construction oversight of projects within the jurisdiction of DSA, which includes State of California public schools (K–12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is subject to revision at any time. Please check DSA's website for currently effective IRs. Only IRs listed on the webpage at <https://www.dgs.ca.gov/dsa/publications> at the time of project application submittal to DSA are considered applicable.